

LESSON ASSIGNMENT

LESSON 4

Heat Injuries.

TEXT ASSIGNMENT

Paragraphs 4-1 through 4-9.

TASKS TAUGHT

081-831-0038, Treat a Casualty for a Heat Injury.

LESSON OBJECTIVES

When you have completed this lesson, you should be able to:

- 4-1. Identify the causes of heat cramps, heat exhaustion, and heat stroke.
- 4-2. Identify the signs and symptoms of heat cramps, heat exhaustion, and heat stroke.
- 4-3. Identify proper treatment procedures for heat cramps, heat exhaustion, and heat stroke.
- 4-4. Identify the heat injury that is a medical emergency.
- 4-5. Identify methods of preventing heat injuries.
- 4-6. Identify factors that make a person more likely to become a heat injury casualty.

SUGGESTION

Complete the exercises at the end of this lesson before beginning the next lesson. The lesson exercises will help you to accomplish the lesson objectives.

LESSON 4

HEAT INJURIES

4-1. INTRODUCTION

A soldier who is in good physical condition and is not injured or sick may think he has nothing to worry about when working or marching in a hot climate. This is not so. Even a healthy person can suffer heat injury.

a. Heat injuries usually occur during hot weather or when a person is working near equipment that produces heat. When a person becomes hot, his body perspires. When the water in perspiration evaporates, it absorbs some of the body's heat and thus cools the body. Perspiration also contains salt. Salt in the body helps to regulate nerve impulses and muscle reactions. If the water and salt lost through perspiration and other body functions are not replaced, heat injury can result.

b. The three principal types of heat injury are heat cramps, heat exhaustion, and heat stroke. Heat stroke is also called sunstroke, heat pyrexia, and hyperthermia. Heat cramps and heat exhaustion will prevent a person from performing his mission effectively and can develop into heat stroke. Heat stroke is a medical emergency, which can be fatal if effective measures are not taken immediately.

4-2. IDENTIFY RISK FACTORS ASSOCIATED WITH HEAT INJURY

There are several factors that make a person more likely to suffer a heat injury. Some of these factors are discussed below.

a. **Dehydration.** A soldier who is not adequately replacing the water lost through perspiration, urination, and respiration is in danger of suffering heat injury.

b. **Lack of Acclimation.** A newly arrived person who has not had a sufficient opportunity to adjust to the hot weather is more likely to suffer a heat injury than a person who has worked in the area for several weeks.

c. **Obesity.** A person is more likely to have a heat injury if he is overweight.

d. **Excessive Use of Alcohol.** Excessive use (abuse) of alcohol or other drugs can contribute to heat injuries.

e. **Medications.** Certain medications make a person more likely to suffer a heat injury.

f. **Age.** Older adults are more likely to have heat injuries than younger adults.

g. **Poor General Health.** A person is more likely to have a heat injury if he is suffering from cardiovascular problems, lack of sleep, poor nutrition, or poor general health.

h. **Previous Occurrence.** A person who has had a previous episode of heat injury is more likely to have another heat injury compared to a person who has not had a previous heat injury.

4-3. INITIATE PREVENTIVE MEASURES

Heat injuries are caused by a lack of water in the body or by a lack of salt and water in the body. Heat injuries can be prevented by consuming adequate amounts of water and salt and by taking other preventive measures.

a. **Drink Sufficient Water.** The amount of water a person needs to drink depends upon the temperature and upon the work being done. A person working in a hot environment should drink at least one full canteen (one quart) every hour. A person who is performing strenuous physical labor or who is working in a very hot environment should drink one quart of water every half hour. When possible, the water should be drunk in small amounts throughout the work period rather than drinking a large amount of water at one time.

(1) A person cannot rely on thirst to remind him to drink water. People in a hot climate seldom feel thirsty enough to replace all of the water lost through perspiration, urination, and respiration. It is better to drink too much water than to not drink enough water. Leaders may need to order their troops to drink.

(2) A soldier should drink extra water before an attack or mission. The extra water in his system will help to keep him physically strong and mentally alert until the tactical situation allows him time to drink again.

b. **Consume Salt in Meals.** A soldier who eats three regular meals each day should get enough salt to replace the salt lost through perspiration. He should eat three full meals each day even if he is not hungry. A soldier should not supplement his regular diet by taking salt tablets.

c. **Wear Clothing Properly.** Clothing protects the body from solar radiation (sunlight). Unprotected skin may develop serious sunburn. When possible, clothing should be light and loose fitting, especially at the neck, wrists, and lower legs. This allows for better air circulation, which helps to cool off the body. Soldiers wearing full individual protective equipment (IPE) to protect themselves from chemical and biological agents are especially prone to heat injury because the protective clothing traps much of the heat energy produced by the body. Soldiers who must wear IPE gear in hot climates may be ordered to not wear their shirts and trousers under the protective over garments.

d. **Take Rest Breaks.** Rest breaks help a person's body to cool. A person working in a moderately hot environment may need to take a 5-minute rest break in a shaded area after each 25-minute work period. A person performing heavy work in a hot environment may need to rest about as much as he works. Rest breaks should be taken only if the tactical situation allows.

e. **Modify Work Schedules as Needed.**

(1) Work schedules must be tailored to fit the climate, the physical condition of the personnel, and the military situation. The heavier work should be performed during the cooler hours of the day.

(2) Work should be performed in a shaded area, if possible.

(3) Personnel who are new to the climate should have their outside work scheduled to promote acclimation to the area. Acclimation (also called acclimatization) is the process that the body goes through while it adjusts to a new environment. Full acclimation (the ability to perform a maximum amount of work in the new environment) can best be achieved by scheduling outside work to be performed during the coolest hours of the morning and afternoon at first (usually an hour in the morning and an hour in the afternoon), then gradually expanding the working periods during the next couple of weeks until the soldiers are working a regular schedule.

4-4. IDENTIFY HEAT CRAMPS

Heat cramps are painful cramps of the voluntary muscles, usually of the abdomen, legs, or arms. The muscle cramps are caused by the inability of the muscles to relax once they have contracted. This condition results from an electrolyte imbalance in the body caused by excessive loss of salt and water from the body. Most of the salt and water are usually lost through perspiration when the person works in hot weather for a long period.

a. **Muscle Spasm.** The most obvious indication of a heat cramp is the soldier's reaction to the muscle cramp or spasm. The casualty will usually grasp or massage the muscle that is having the spasm if the spasm is in an arm or leg. If the spasm is in his abdominal region, he may hold his abdomen and bend over at the waist.

b. **Moist Skin.** The casualty will normally be sweating profusely. In some individuals, the skin will be pale or gray also.

c. **Thirst.** The casualty will probably be very thirsty.

d. **Dizziness.** The casualty may feel dizzy.

e. **Normal Vital Signs.** The casualty's body temperature will be either normal or only slightly elevated and his blood pressure will be within his normal range.

4-5. TREAT HEAT CRAMPS

A person with heat cramps will recover if the lost salt and water is replaced and steps are taken to prevent the heat cramps from developing into more serious heat injury. Steps for treating a casualty with heat cramps are given below.

a. **Protect Casualty From Sun.** Move the casualty to a cool, shaded area to rest. If shade is not available, improvise a shade using ponchos, blankets, or other available materials to protect the casualty from direct sunlight. Have the casualty sit or lie in a comfortable position.

b. **Loosen Clothing.** Loosen any tight-fitting clothing.

NOTE: If you are in a chemical environment (chemical agents present in the air and/or on the ground), do not loosen or remove the casualty's protective mask, protective clothing, or boots.

c. **Give Water.** If the casualty is not nauseous (feels as though he is going to vomit), give the casualty cool water and salt solution to drink. The solution will help to restore the body's natural fluid and electrolyte balance. To create the solution, dissolve 1/4 teaspoon of loose salt (same as one packet of salt from rations) in a canteen filled with one quart of cool water. Have the casualty slowly drink the entire canteen within 1 hour. After the casualty has consumed the quart of salt and water solution, have him drink cool, unsalted water.

(1) If the casualty feels nauseous, encourage him to drink a quart of cool water with no salt added. (Vomiting caused by drinking salty water will result in the loss of more water and salt from his body.) When the nausea has passed, give him salty water to drink or salty food to eat.

(2) If no salt is available, have the casualty drink cool, unsalted water.

d. **Observe Casualty.** Allow the casualty to rest. Observe the casualty to see if the cramps go away and to ensure that the casualty continues to consume water. If the casualty recovers and resumes his activities, continue to observe the casualty for reoccurrence of heat injury.

e. **Record Treatment.** Record the casualty's signs and symptoms and the treatment administered on a DD Form 1380, U.S. Field Medical Card (FMC).

f. **Evacuate, If Needed.** If the casualty continues to have severe cramps or cannot drink cool water, evacuate him to a medical treatment facility. Attach the Field Medical Card to the casualty's clothing.

4-6. IDENTIFY HEAT EXHAUSTION

Heat exhaustion is a condition caused by an excessive loss of water and electrolytes from the body (usually from heavy perspiration) resulting in hypovolemia (a decrease in the fluid in the casualty's blood circulatory system). It usually occurs in otherwise fit individuals who are performing tasks requiring heavy physical work in a hot environment. The casualty's body temperature will usually be normal.

a. **Most Common Signs and Symptoms of Heat Exhaustion.** A casualty with heat exhaustion will usually:

- (1) Perspire heavily.
- (2) Have skin that is pale (gray in a dark-skinned individual) and cool to the touch.
- (3) Have a headache.
- (4) Feel weak and/or dizzy.
- (5) Have a loss of appetite.

b. **Other Signs and Symptoms.** Other signs and symptoms that may accompany heat exhaustion include:

- (1) Heat cramps.
- (2) Nausea (urge to vomit) with or without actual vomiting.
- (3) Urge to defecate.
- (4) Chills ("gooseflesh").
- (5) Rapid breathing (short of breath).
- (6) Tingling in the hands or feet.
- (7) Mental confusion.

4-7. TREAT HEAT EXHAUSTION

Heat exhaustion is treated by having the casualty drink water and by taking precautions to keep his condition from becoming worse.

a. **Protect Casualty From Sun.** Move the casualty to a cool, shaded area to rest. If shade is not available, improvise a shade using ponchos, blankets, or other available materials to protect the casualty from direct sunlight. Have the casualty lie down in a comfortable position.

b. **Loosen Clothing.** Loosen or remove any tight-fitting clothing or boots, unless you are in a chemical environment.

c. **Cool Casualty.** If it is a very hot day, pour water over the casualty and fan him to promote the loss of body heat.

NOTE: If you are in a chemical environment, do not pour water over the casualty.

d. **Elevate Legs.** Elevate the casualty's legs so his feet are above the level of his heart and place a pack, small log, rolled-up field jacket, or other stable prop under his feet. If a litter is available, have the casualty lie on the litter and elevate the foot of the litter. Elevating his legs will help blood to return from his legs to his heart and will help to prevent shock.

e. **Give Water.** If the casualty is not nauseous, add 1/4 teaspoon (one ration packet) of salt to a one-quart canteen of cool water and have the casualty slowly drink the solution within a one-hour period. After the casualty has consumed the salty water solution, have him drink cool, unsalted water.

(1) If the casualty feels nauseous, have him drink a quart of cool water with no salt added. When the nausea has passed, give him salty water to drink or salty food to eat.

(2) If salt is not readily available, have the casualty drink cool, unsalted water.

f. **Observe Casualty.** Observe the casualty as he is resting to see if his condition improves and to ensure that he continues to consume water. If the casualty recovers and resumes his activities, continue to observe the casualty for reoccurrence of heat injury.

g. **Record Treatment.** Record the casualty's signs and symptoms and the treatment administered on a DD Form 1380, U.S. Field Medical Card.

h. **Evacuate, if Needed.** If the casualty is nauseated and cannot drink the unsalted water or if his signs and symptoms do not improve in about 20 minutes:

(1) Initiate an intravenous infusion using Ringer's lactate or normal saline.

(2) Attach the Field Medical Card to the casualty's clothing.

(3) Evacuate the casualty to a medical treatment facility.

4-8. IDENTIFY HEAT STROKE

Heat stroke is caused by a failure of the body's temperature regulating system. Heat stroke comes on suddenly. The core (rectal) body temperature can rise from normal to 106°F or more in 10 to 15 minutes. If the situation is not controlled quickly, the vulnerable cells of the brain may be destroyed and irreversible central nervous system (CNS) damage may occur. Heat stroke is a medical emergency that can result in death if it is not corrected quickly. Signs and symptoms of heat stroke include:

- a. Lack of normal perspiration.

NOTE: If a soldier is not perspiring or perspiring only slightly while others who are performing similar work in the same environment are perspiring heavily, the soldier's natural cooling system (perspiration) has stopped working and his body can no longer cool itself.

- b. Skin that is hot to the touch.
- c. Elevated temperature.
- d. Headache.
- e. Dizziness.
- f. Mental confusion.
- g. Stomach pain, nausea, or cramps.
- h. Weakness.
- i. Rapid, shallow breathing.
- j. Rapid and weak pulse.
- k. Sudden loss of consciousness.

4-9. TREAT HEAT STROKE

Heat stroke is treated by quickly cooling the casualty's body and evacuating him to a medical treatment facility where additional measures can be taken. If the casualty is unconscious, open his airway and administer mouth-to-mouth resuscitation or cardiopulmonary resuscitation (CPR) if needed. (These procedures are covered in Subcourse MD0532, Cardiopulmonary Resuscitation.)

- a. **Perform Immediate Cooling.** Immerse the casualty's trunk in cool water or pour cool water onto the casualty and fan him. This will help to control his temperature.

b. **Evacuate.** Evacuate the casualty to the nearest medical treatment facility at once. Continue to perform cooling measures during evacuation.

c. **Perform Other Cooling Procedures.** Additional procedures for cooling the casualty are given below. Do not delay evacuation in order to begin these procedures. Continue to perform cooling measures while evacuating the casualty.

- (1) Move the casualty to a shady area or improvise a shade.
- (2) Have the casualty lie down and elevate his legs.
- (3) Remove the casualty's outer garments, protective clothing (leave mask on if in a chemical environment), and boots.
- (4) Pour water onto the casualty and fan him to promote evaporation.
- (5) Massage the casualty's arms and legs with cold water. (Massaging helps the skin capillaries to dilate, which results in greater heat loss.)
- (6) Place ice bags on the sides of the casualty's neck and under his armpits.
- (7) If the casualty is conscious, have him drink one quart of salt and water solution (1/4 teaspoon of salt in one quart of cool water) if he is able. If salt is not readily available or the casualty is nauseous, have the casualty drink at least one quart of cool water if he can.
- (8) If the casualty is unconscious, vomiting, or unable to retain fluids given by mouth, start an intravenous infusion of Ringer's lactate or normal saline. Maintain a systolic pressure of at least 90 mm Hg (millimeters of mercury).

d. **Record Treatment.** Record the casualty's signs and symptoms and the treatment administered on a DD Form 1380, U.S. Field Medical Card. If you have taken the casualty's temperature, record it on the Field Medical Card. Attach the completed Field Medical Card to the casualty's clothing.

[Continue with Exercises](#)

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EXERCISES, LESSON 4

INSTRUCTIONS: Circle the letter of the response that BEST completes the statement or BEST answers the question. After you have completed all of the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced after the solution.

1. You are working in a hot climate. A fellow worker is perspiring only slightly even though you and others are perspiring heavily. He is behaving in a confused manner. When you take his pulse, you notice that his pulse rate is high and his skin is hot to the touch. He is probably suffering from:
 - a. Heat cramps.
 - b. Heat exhaustion.
 - c. Heat stroke.

2. You are working in a hot climate. A fellow worker suddenly doubles-up and grabs his abdomen. He is sweating a great deal. This person is probably suffering from:
 - a. Heat cramps.
 - b. Heat exhaustion.
 - c. Heat stroke.

3. You are working in a hot climate. A fellow worker is perspiring heavily. He complains of dizziness and nausea and is breathing rapidly. He is probably suffering from:
 - a. Heat cramps.
 - b. Heat exhaustion.
 - c. Heat stroke.

4. How does alcoholic beverages affect a person's resistance to heat injuries?
 - a. Alcohol abuse makes a person more likely to suffer heat injury.
 - b. Alcohol abuse makes a person less likely to suffer heat injury.
 - c. Alcohol abuse has no effect on a person's resistance to heat injury.
5. Which of the following is/are considered a life-threatening medical emergency?
 - a. Heat cramps.
 - b. Heat exhaustion.
 - c. Heat stroke.
 - d. All of the above.
6. You are preparing a salt and water solution for a heat injury casualty. How much salt should you add to a one-quart canteen full of cool water?
 - a. 1 tablespoon of salt.
 - b. 1 teaspoon of salt.
 - c. 1/2 teaspoon of salt.
 - d. 1/4 teaspoon of salt.
7. You are giving a salt and water solution to a casualty with heat cramps. Which of the following statements is correct?
 - a. The casualty should drink one quart of salt and water solution as quickly as possible, then continue to drink additional salt and water solution until he is no longer thirsty.
 - b. The casualty should drink one quart of salt and water solution as quickly as possible, then continue to drink additional water until he is no longer thirsty.
 - c. The casualty should drink one quart of salt and water slowly, but should drink it within one hour. After he finishes the salt and water solution he should drink cool, unsalted water.

8. Which of the following statements is/are true?
- a. If you drink enough water to keep from being thirsty, you are drinking all the water your body needs.
 - b. When in a hot climate, you should take one or two salt tablets with each meal.
 - c. A military leader should never order his troops to drink water.
 - d. Soldiers should drink water in small amounts throughout the work period rather than drinking a large amount of water one time.
 - e. All of the above are true.
9. Which of the following is more likely to suffer a heat injury in a country that has very hot weather?
- a. A soldier who has been in the country for several weeks.
 - b. A soldier who has just arrived in the country.
10. Two soldiers have been in a country with a hot climate for the same amount of time. One has suffered heat injuries; the other has not. Which is more likely to suffer a heat injury?
- a. The soldier who has suffered previous heat injuries.
 - b. The soldier who has not suffered previous heat injuries.
11. Which of the following is more likely to suffer heat injury?
- a. A soldier in full protective (IPE) gear.
 - b. A soldier in normal combat clothing.

12. A heat stroke casualty is unconscious. What measure, if any, should you take to replace the casualty's body fluids?
- a. Pour cool water into the casualty's mouth until he swallows.
 - b. Initiate an intravenous infusion.
 - c. Pour cool water into the casualty's nose until he swallows.
 - d. Make no effort to administer fluids until the casualty regains consciousness.
13. A heat injury casualty is conscious. When he takes a swallow of the salt and water solution, he says that he cannot drink any more because he feels as though he is going to throw up. Should you force him to continue drinking the solution?
- a. Yes.
 - b. No.
14. A casualty in a chemical environment has heat exhaustion. How will being in a chemical environment affect the treatment of the heat injury?
- a. You will not have the casualty to drink fluids.
 - b. You will not add salt to the water before he drinks the water.
 - c. You will not elevate his legs.
 - d. You will not loosen or remove his clothing.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 4

1. c (para 4-8)
2. a (para 4-4)
3. b (para 4-6)
4. a (para 4-2d)
5. c (paras 4-1b, 4-8)
6. d (paras 4-5c, 4-7e, 4-9c(7))
7. c (para 4-5c)
8. d (paras 4-3a, b)
9. b (para 4-2b)
10. a (para 4-2h)
11. a (para 4-3c)
12. b (para 4-9c(8))
13. b (paras 4-5c(1), 4-7e(1), 4-9c(7))
14. d (para 4-7b)

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